Annexure – VII

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE FINAL REPORT OF THE WORK DONE ON THE PROJECT

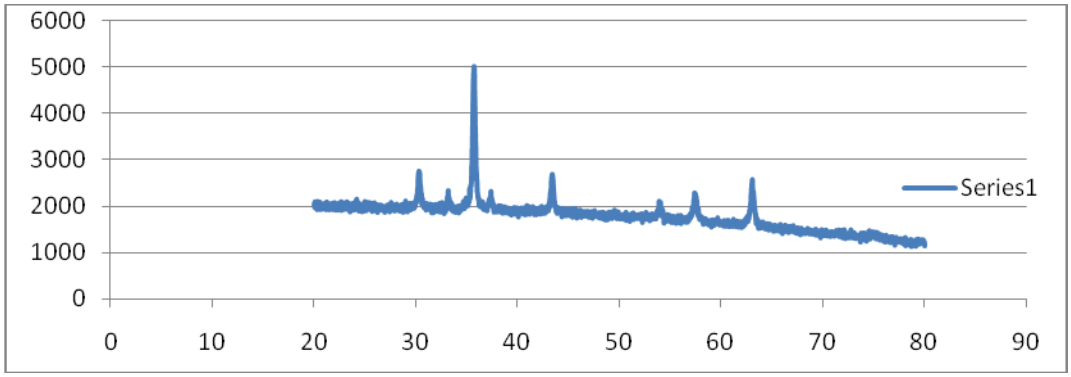
1. Title of the Project **"Microwave Assisted Preparation of Nanocrystaline Cobalt Ferrite($CoFe_2O_4$) for Supercapacitive Application"**
2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR **Dr V.C. Mahajan**
3. NAME AND ADDRESS OF THE INSTITUTION **Vivekanand College, Tarabai Park, Kolhapur.**
4. UGC APPROVAL LETTER NO. AND DATE: **47-1691/10(WRO) dt 16th Aug 2011**
5. DATE OF IMPLEMENTATION **16st Aug 2011**
6. TENURE OF THE PROJECT **2 years**
7. TOTAL GRANT ALLOCATED Rs. **1,45,000/-**
8. TOTAL GRANT RECEIVED Rs. **122,500/-**
9. FINAL EXPENDITURE Rs. **1,43,837/-**
10. TITLE OF THE PROJECT **Microwave Assisted Preparation of Nanocrystaline Cobalt Ferrite($CoFe_2O_4$) for Supercapacitive Application**
11. OBJECTIVES OF THE PROJECT
    - Install the experimental setup.
    - Microwave assisted preparation of **Cobalt Ferrite($CoFe_2O_4$) powder and pellet formation.**
    - Characterization of **Cobalt Ferrite($CoFe_2O_4$) powder using XRD,SEM,IR etc. techniques.**
    - Supercapacitive performance testing using current, voltage and charge-discharge studies .
12. WHETHER OBJECTIVES WERE ACHIEVED **Yes**
13. ACHIEVEMENTS FROM THE PROJECT :--

14. SUMMARY OF THE FINDINGS

The first part of the sanctioned project i.e. **Preparation of Nanocrystaline Cobalt Ferrit($CoFe_2O_4$) powder and pellet. Nanocrystalline Cobal Ferrite($CoFe_2O_4$) have been prepared by Microwave assisted method.**Cobalt nitrate and ferric nitrate are taken in the mole proportion(About 50gm total quantity). Nitrates are crushed in the agate morter. Some double distilled water is added to form precursor solution. Urea(1gm) is added to precursor solution as fuel. The precursor solution is taken in the alumina crucible. Alumina crucible is placed in the microwave oven(SAMSUNG Model No.CE 104-VD) on 650W for 10 minutes. Due to microwave heating combustion takes place and ferrite is formed. Further it is sintered at 600^{o}C for six hours.

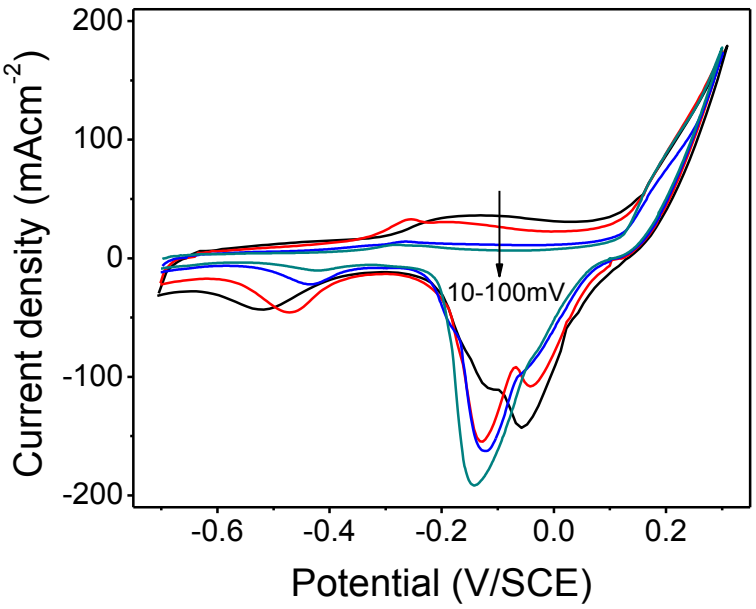
Formation of Ferrite material is tested by XRD and IR characterization. It is found that tetrahedral and octahedral absorption bands are observed in IR spectra.

From XRD,(220),(311),(400),(422),(333) and (440) planes are observed which are characteristics of ferrite.

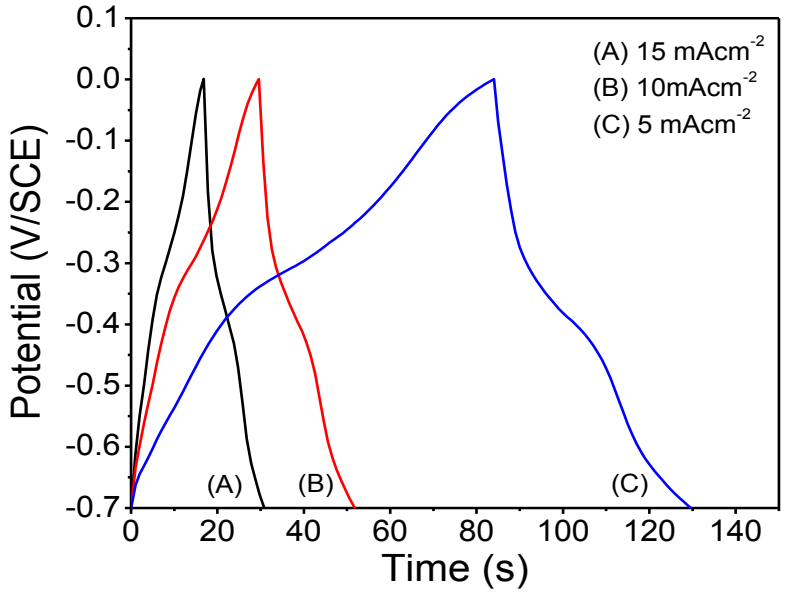


SEM studies shows that, average crystallite size is about 30nm.

One surface of the ferrite pellet is coated with silver paste and soldered with wire to form electrode, 2 Mole KOH solution is taken as electrolyte to tests supercapacitive performance. Supercapacitive performance is tested on Battery Cycler Machine(Wonatech WBCS-300 Model) by Cyclic Voltammetry and Charge discharge methods. The graphs of Cyclic Voltammetry and Charge discharge are given below.



Fig(2): Cyclic Voltammetry Curves



Fig(3): Charge and Discharge Curves

Specific Capacitance is calculated by formula

Cs=Area* 1000/Mass* Scan rate

Area is taken from Cyclic Voltammetry curve .

For scan rage 10mV/s, Mass=0.5gm,

Specific Capacitance becomes 8F/gm.

15. CONTRIBUTION TO THE SOCIETY

Electrochemical Capacitor has received much attention due to their possible application as high power energy storage devices. Double layer electrochemical capacitors, base on metal oxides material having a high surface area have been developed with promising results. The development of power system with a combination of high energy density and high power density becomes one of the argent issues for several important applications, especially for electrical vehicles, pace-maker and Cellular phones. As the capacity of conventional capacitor is less to deliver enough electricity in required time interval, supercapacitor become need of the ours.

Presently, supercapacitors available in the market are costly one. The Indian patents field and technology to fabricate supercapacitor is scare. Therefore, present invention will provide indigenous technology for making the supercapacitors locally in India.

The area of work is of national important in the Indian context of energy crises. It is important to energy storage devices useful for rural area and also for military purpose.

16. WHETHER ANY PH.D. ENROLLED/PRODUCED OUT OF THE PROJECT: **No**

17. NO. OF PUBLICATIONS OUT OF THE PROJECT- –

(PRINCIPAL INVESTIGATOR)

Medical
CO- INVESTIGATOR

VIVEKANAND COLLEGE * ESTD. JUNE 1964 * KOLHAPUR-416003

(PRINCIPAL)
PRINCIPAL
Vivekanand College,
Kolhapur.
(Seal)